

**Summary Report**  
**Mercury Analyses for the Great Salt Lake for 2005**

Prepared by:

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## **Introduction**

The information provided in this report is intended to supplement the data presented to the Great Salt Lake (GSL) Science Panel November 9, 2005. The data given to the Science Panel was in a power point presentation format.

Samples for mercury (Hg) analyses (mercury and monomethylmercury) were collected at three time points from the GSL in 2005, June 10, July 21 and September 15. Data contained in this report was taken directly from the laboratory reports that were provided by Brooks Rand. Snapshot copies from the Brooks Rand reports were used to avoid transcription errors.

This report provides a very brief overview of the methods and results and is not intended to be comprehensive.

## **Methods**

Surface water samples were collected in June, July, and September 2005 at the following stations (although each station was not necessarily sampled during each of these three months): 1, 2, 4, 5, 6, 7, 8, 9, 10, 14, 19A, 19B, and 20 (Figure 2-1). In addition, deep brine samples were collected at Stations 8 and 10. Samples were analyzed for Hg (total), Hg (monomethyl). Both total recoverable (non-filtered) and dissolved concentrations (filtered by Brooks Rand) were reported in 2005.

Collection Techniques: Surface samples were collected by placing the bottle 6 inches below the surface and removing the cap until the bottle was full and then the cap was replaced while holding the bottle under the water.

Deep brine samples were collected approximately 12 inches off the bottom of the Lake and were usually collected at a depth of 24 ft. Color, smell and conductivity of the deep brine was used as an indicator that this layer of the Lake was properly located before a sample was collected. Deep brine samples were collected by using a peristaltic pump to bring the brine water to the surface via a clean silicon tube. The pump was allowed to run for 3-4 minutes at each station before a sample was collected. Sample bottles were filled full and capped.

Clean techniques were used to collect the samples, for example all sample bottles were prepared by Brooks Rand and shipped to Kennecott for use. The bottles were in double bags. Gloves were worn to collect the samples and a clean hands technique was used whereby after samples were collected they were given to a second person and the bottles were placed in two bags, placed in a cooler, put on ice and shipped the same day by overnight courier to the laboratory for analyses.

Mercury Analyses: Brooks Rand reported the following:

**Mercury Analysis by EPA Method 1631, Revision E (BRL SOP BR-0006)**

All samples are prepared and analyzed in accordance with EPA Method 1631E. Water samples are oxidized with bromine monochloride (BrCl). Samples are then analyzed with stannous chloride (SnCl<sub>2</sub>) reduction, single-trap gold amalgamation, and cold vapor atomic fluorescence spectrometry (CVAFS) using a BRL Model III CVAFS Mercury Analyzer.

**Monomethyl Mercury Analysis by Draft EPA Method 1630 (BRL SOP BR-0011)**

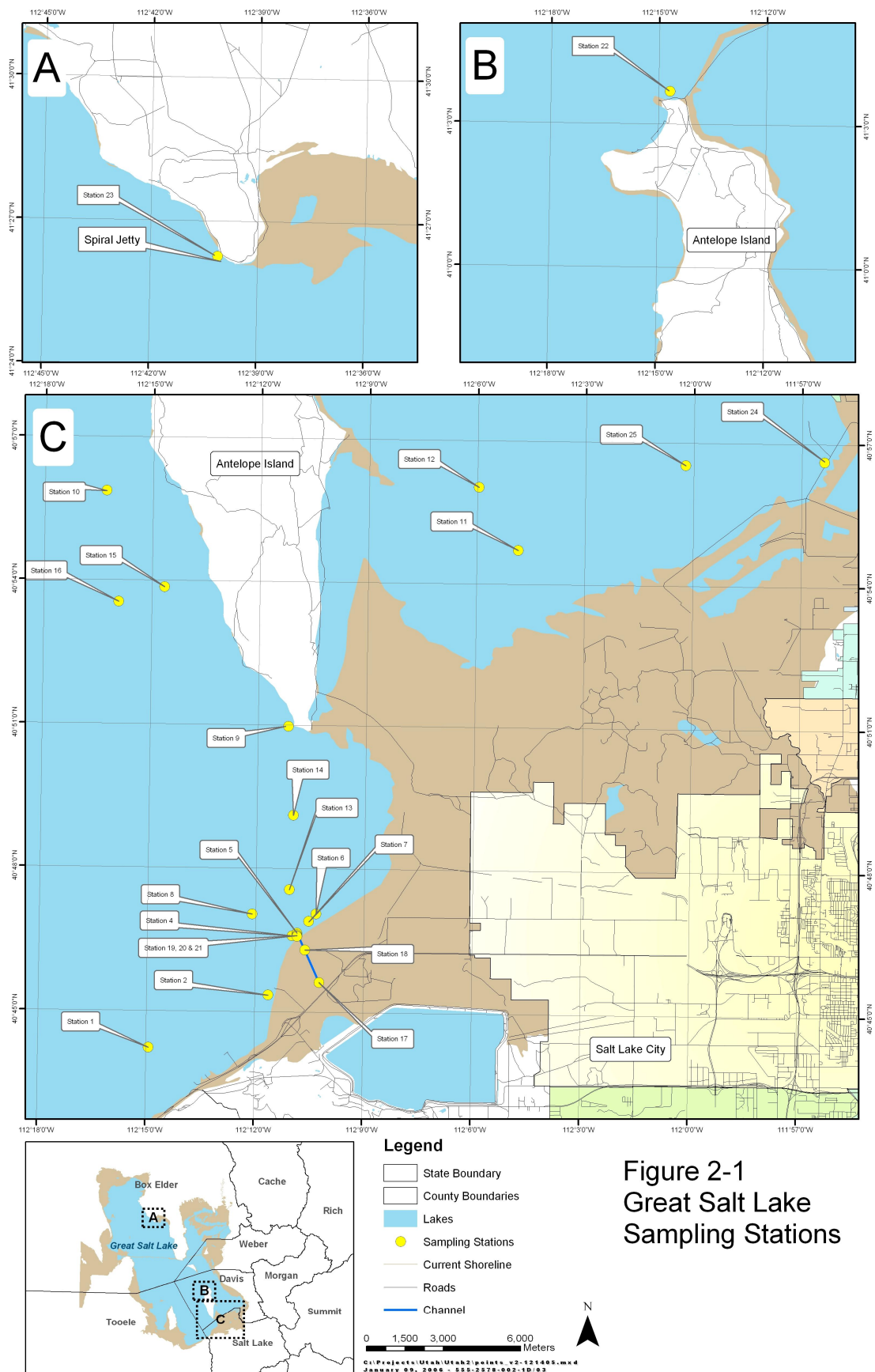
Water samples are prepared by distillation. Samples are analyzed by ethylation, purge and trap, GC column separation, thermal decomposition and CVAFS using a BRL Model III CVAFS Mercury Analyzer.

QA/QC - Field blank samples were collected on each sample date (typically 2 samples on each sample date) and were shipped back to the lab to demonstrate cleanliness of the equipment and collection technique. Milli-Q water (deionized water) that was sent to Kennecott from Brooks Rand was used to fill the bottles. The bottles were filled in the field and returned to the laboratory for analyses. Additionally at the laboratory, blank, replicates, and spiked samples were prepared and analyzed at the laboratory (each QA/QC sample type was included at approximately 10% of the total number of field samples analyzed).

## **Results**

The results of the analytical measurements for mercury (total and dissolved) as well as monomethylmercury (total and dissolved) are presented in Tables 1-3 below. These tables are directly from the final reports provided to Kennecott by Brooks Rand. No editing of the data has occurred and all samples that were collected and analyzed for mercury are reported. This constitutes the entire data set on mercury collected to date by Kennecott/Rio Tinto for the GSL. Information collected on water chemistry and sample type is presented in Table 4. Station (GPS) coordinates are located in Table 5. Not all stations shown in Figure 1 and Table 5 were sampled for mercury in 2005. Stations sampled for mercury in 2005 are shown in Tables 1-3.

Figure 1. Map of Great Salt Lake with sample stations shown.



**Table 1. Summary of Mercury Concentrations for 2005 June 10 Sampling.**

Mercury analyses in June were for total mercury only– samples were acidified upon receipt at the laboratory.

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*Summary of Results for*  
**Kennecott Utah Copper/Rio Tinto**

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Lab Project # KUC002  
Lab Tracking # 05BR0861

Lab Services KUC002c

### Hg

Sample Identification	BRL Number	Preparation date	Analysis date	Batch #	Result	Units	Qualifier (Q)
Field Blank	05BR0861 - 2	7/1/2005	7/5/2005	05-0444	0.100	ng/L	U
Station 1	05BR0861 - 8	7/1/2005	7/5/2005	05-0444	3.660	ng/L	
Station 2	05BR0861 - 16	7/1/2005	7/5/2005	05-0444	2.740	ng/L	
Station 6	05BR0861 - 24	7/1/2005	7/5/2005	05-0444	30.400	ng/L	
Station 8	05BR0861 - 32	7/1/2005	7/5/2005	05-0444	3.060	ng/L	
Station 14	05BR0861 - 40	7/1/2005	7/5/2005	05-0444	3.100	ng/L	
Station 20	05BR0861 - 48	7/1/2005	7/5/2005	05-0444	8.300	ng/L	
Station 19A	05BR0861 - 56	7/1/2005	7/5/2005	05-0444	3.290	ng/L	
Station 19B	05BR0861 - 64	7/1/2005	7/5/2005	05-0444	3.330	ng/L	

➡ Note station 6 sample is flagged as containing both high suspended solids and high aluminum. This is likely due to sediment disturbance by the boat in shallow water.

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### Hg(Monomethyl)

Sample Identification	BRL Number	Preparation date	Analysis date	Batch #	Result	Units	Qualifier (Q)
Field Blank	05BR0861 - 3	7/6/2005	7/7/2005	05-0464	0.020	ng/L	U,H
Station 1	05BR0861 - 9	7/6/2005	7/7/2005	05-0464	0.863	ng/L	H
Station 2	05BR0861 - 17	7/6/2005	7/7/2005	05-0464	2.650	ng/L	H
Station 6	05BR0861 - 25	7/6/2005	7/7/2005	05-0464	3.060	ng/L	H
Station 8	05BR0861 - 33	7/6/2005	7/7/2005	05-0464	0.899	ng/L	H
Station 14	05BR0861 - 41	7/6/2005	7/7/2005	05-0464	0.587	ng/L	H
Station 20	05BR0861 - 49	7/6/2005	7/7/2005	05-0464	4.430	ng/L	H
Station 19A	05BR0861 - 57	7/6/2005	7/7/2005	05-0464	0.191	ng/L	H
Station 19B	05BR0861 - 65	7/6/2005	7/7/2005	05-0464	0.246	ng/L	H

**Table 2. Summary of Mercury Concentrations for 2005 July 21 Sampling.**

Mercury analyses in July were for total mercury only with the exception of the deep brine samples which were analyzed as total and dissolved. The samples for dissolved mercury were not acidified and were filtered at the laboratory. Samples for total mercury were acidified upon receipt at the laboratory.

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Lab Tracking # 05BR1050

Lab Services KUC002c

**Hg, total**

Sample Identification	BRL Number	Preparation date	Analysis date	Batch #	Result	Units	Qualifier (Q)
Station #1	05BR1050 - 7	8/9/2005	8/11/2005	05-0553	4.980	ng/L	
Station #2	05BR1050 - 15	8/9/2005	8/11/2005	05-0553	5.150	ng/L	
Station #4	05BR1050 - 23	8/9/2005	8/11/2005	05-0553	3.380	ng/L	
Station #8 (Deep Brine) - T	05BR1050 - 31	8/9/2005	8/11/2005	05-0553	69.400	ng/L	
Station #10 (SW) - T	05BR1050 - 41	8/9/2005	8/11/2005	05-0553	4.030	ng/L	
Station #8 (SW)	05BR1050 - 49	8/9/2005	8/11/2005	05-0553	3.260	ng/L	
Station #10 (SW) FD	05BR1050 - 57	8/9/2005	8/11/2005	05-0553	3.060	ng/L	
Station #8 (Deep Brine) FD - T	05BR1050 - 65	8/9/2005	8/11/2005	05-0553	70.900	ng/L	
Station #10 (Deep Brine) - T	05BR1050 - 75	8/9/2005	8/11/2005	05-0553	65.600	ng/L	
Station #5	05BR1050 - 85	8/9/2005	8/11/2005	05-0553	5.000	ng/L	
Station #7	05BR1050 - 93	8/9/2005	8/11/2005	05-0553	5.190	ng/L	
Station #9	05BR1050 - 101	8/9/2005	8/11/2005	05-0553	3.540	ng/L	
Field Blank	05BR1050 - 106	8/9/2005	8/11/2005	05-0553	2.160	ng/L	
Filter Blank	05BR1050 - 111	8/9/2005	8/11/2005	05-0553	0.100	ng/L	U

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**Hg(Monomethyl), total**

Sample Identification	BRL Number	Preparation date	Analysis date	Batch #	Result	Units	Qualifier (Q)
Station #1	05BR1050 - 8	8/15/2005	8/16/2005	05-0536	1.000	ng/L	
Station #2	05BR1050 - 16	8/15/2005	8/16/2005	05-0536	1.230	ng/L	
Station #4	05BR1050 - 24	8/15/2005	8/16/2005	05-0536	1.380	ng/L	
Station #8 (Deep Brine) - T	05BR1050 - 33	8/15/2005	8/16/2005	05-0536	63.500	ng/L	
Station #10 (SW) - T	05BR1050 - 42	8/15/2005	8/16/2005	05-0536	0.649	ng/L	
Station #8 (SW)	05BR1050 - 50	8/15/2005	8/16/2005	05-0536	1.490	ng/L	
Station #10 (SW) FD	05BR1050 - 58	8/15/2005	8/16/2005	05-0536	1.640	ng/L	
Station #8 (Deep Brine) FD - T	05BR1050 - 67	8/15/2005	8/16/2005	05-0536	59.300	ng/L	
Station #10 (Deep Brine) - T	05BR1050 - 77	8/15/2005	8/16/2005	05-0536	55.900	ng/L	
Station #5	05BR1050 - 86	8/15/2005	8/16/2005	05-0536	2.180	ng/L	
Station #7	05BR1050 - 94	8/15/2005	8/16/2005	05-0536	1.160	ng/L	
Station #9	05BR1050 - 102	8/15/2005	8/16/2005	05-0536	0.740	ng/L	
Field Blank	05BR1050 - 107	8/15/2005	8/16/2005	05-0536	0.020	ng/L	U

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**Hg(Monomethyl), dissolved**

Sample Identification	BRL Number	Preparation date	Analysis date	Batch #	Result	Units	Qualifier (Q)
Station #8 (Deep Brine) - D	05BR1050 - 34	8/15/2005	8/16/2005	05-0536	26.900	ng/L	H
Station #8 (Deep Brine) FD - D	05BR1050 - 68	8/15/2005	8/16/2005	05-0536	30.500	ng/L	H
Station #10 (Deep Brine) - D	05BR1050 - 78	8/15/2005	8/16/2005	05-0536	35.500	ng/L	H

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**Hg, dissolved**

Sample Identification	BRL Number	Preparation date	Analysis date	Batch #	Result	Units	Qualifier (Q)
Station #8 (Deep Brine) - D	05BR1050 - 32	8/9/2005	8/11/2005	05-0553	46.000	ng/L	H
Station #8 (Deep Brine) FD - D	05BR1050 - 66	8/9/2005	8/11/2005	05-0553	58.700	ng/L	H
Station #10 (Deep Brine) - D	05BR1050 - 76	8/9/2005	8/11/2005	05-0553	52.900	ng/L	H



### Table 3. Summary of Mercury Concentrations for 2005 September 15 Sampling.

Mercury analyses in September were for total and dissolved mercury. Samples for dissolved analyses were not acidified and were filtered at the laboratory. Samples for total mercury were acidified upon receipt at the laboratory.

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Lab Project # KUC002  
Lab Tracking # 05BR1375

*Summary of Results for*  
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Lab Services KUC002c

#### Hg, total

Sample Identification	BRL Number	Preparation date	Analysis date	Batch #	Result	Units	Qualifier (Q)
Field Blank	05BR1375 - 1	9/28/2005	10/4/2005	05-0733	0.670	ng/L	
Surface Station 1	05BR1375 - 2	9/28/2005	10/4/2005	05-0733	6.520	ng/L	
Surface Station 2	05BR1375 - 3	9/28/2005	10/4/2005	05-0733	8.550	ng/L	
Surface Station 5	05BR1375 - 4	9/28/2005	10/4/2005	05-0733	8.910	ng/L	
Surface Station 6	05BR1375 - 5	9/28/2005	10/4/2005	05-0733	9.010	ng/L	
Surface Station 7	05BR1375 - 6	9/28/2005	10/4/2005	05-0733	16.900	ng/L	
Surface Station 8	05BR1375 - 7	9/28/2005	10/4/2005	05-0733	7.530	ng/L	
Surface Station 9	05BR1375 - 8	9/28/2005	10/4/2005	05-0733	7.970	ng/L	
Surface Station 10	05BR1375 - 9	9/28/2005	10/4/2005	05-0733	15.300	ng/L	
Deep Brine Station 8-T	05BR1375 - 10	9/28/2005	10/4/2005	05-0733	89.900	ng/L	
Deep Brine Station 10-T	05BR1375 - 12	9/28/2005	10/4/2005	05-0733	96.600	ng/L	

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#### Hg, dissolved

Sample Identification	BRL Number	Preparation date	Analysis date	Batch #	Result	Units	Qualifier (Q)
Deep Brine Station-8-D	05BR1375 - 11	9/28/2005	10/4/2005	05-0733	51.400	ng/L	
Deep Brine Station 10-D	05BR1375 - 13	9/28/2005	10/4/2005	05-0733	58.300	ng/L	
Filter Blank	05BR1375 - 63	9/28/2005	10/4/2005	05-0733	0.100	ng/L	U
Filter Blank	05BR1375 - 93	9/28/2005	10/4/2005	05-0733	0.100	ng/L	U

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**Lab Services** KUC002c

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**Hg(Monomethyl), total**

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Sample Identification	BRL Number	Preparation date	Analysis date	Batch #	Result	Units	Qualifier (Q)
Field Blank	05BR1375 - 14	10/5/2005	10/6/2005	05-0739	0.020	ng/L	U
Surface Station 1	05BR1375 - 15	10/5/2005	10/6/2005	05-0739	1.750	ng/L	
Surface Station 2	05BR1375 - 16	10/5/2005	10/6/2005	05-0739	1.970	ng/L	
Surface Station 5	05BR1375 - 17	10/5/2005	10/6/2005	05-0739	2.430	ng/L	
Surface Station 6	05BR1375 - 18	10/5/2005	10/6/2005	05-0739	2.010	ng/L	
Surface Station 7	05BR1375 - 19	10/5/2005	10/6/2005	05-0739	2.520	ng/L	
Surface Station 8	05BR1375 - 20	10/5/2005	10/6/2005	05-0739	7.410	ng/L	
Surface Station 9	05BR1375 - 21	10/5/2005	10/6/2005	05-0739	1.710	ng/L	
Surface Station 10	05BR1375 - 22	10/5/2005	10/6/2005	05-0739	3.050	ng/L	
Deep Brine Station 8-T	05BR1375 - 23	10/5/2005	10/6/2005	05-0739	80.800	ng/L	
Deep Brine Station 10-T	05BR1375 - 25	10/5/2005	10/6/2005	05-0739	67.100	ng/L	

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**Hg(Monomethyl), dissolved**

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Sample Identification	BRL Number	Preparation date	Analysis date	Batch #	Result	Units	Qualifier (Q)
Deep Brine Station 8-D	05BR1375 - 24	10/5/2005	10/6/2005	05-0739	43.600	ng/L	
Deep Brine Station 10-D	05BR1375 - 26	10/5/2005	10/6/2005	05-0739	46.200	ng/L	
Filter Blank	05BR1375 - 94	10/5/2005	10/6/2005	05-0739	0.020	ng/L	U
Filter Blank	05BR1375 - 95	10/5/2005	10/6/2005	05-0739	0.020	ng/L	U

**Table 4. Summary of the field notes for June, July and September; stations, sample types and water chemistry.**

<b>Date</b>	<b>Station</b>	<b>Water Temperature</b>	<b>Water Depth**</b>	<b>Brine Shrimp</b>	<b>Surface Conductivity</b>	<b>Surface pH</b>
6/10/2005	Station 1	18.5 C	10 ft	Yes	141,300	8.10
6/10/2005	Station 2	18.5 C	8 in	Yes	140,500	8.10
6/10/2005	Station 6	18.0 C	1 ft.	Yes	118,700	8.20
6/10/2005	Station 8	19.0 C	25 ft	Yes	ND	ND*
6/10/2005	Station 14	17.5 C	ND	Yes	119,900	8.10
6/10/2005	Station 19	ND	6 in	Yes	ND	ND*
6/10/2005	Station 20	19.0 C	1 ft.	Yes	141,000	8.10
6/11/2005	Station 22	ND	2.5 ft.	Yes	ND	ND*
6/11/2005	Station 23	ND	1.5 ft.	No	ND	ND*
6/21/2005	Station 1	27.1 C	13 ft	Yes	114,000	8.0
6/21/2005	Station 2	31.6 C	3 ft	Yes	123,000	8.0
6/21/2005	Station 4	29.2 C	3 ft	Yes	110,000	8.0
6/21/2005	Station 5	29.8 C	2 ft	Yes	110,000	8.0
6/21/2005	Station 7	29.3 C	3 ft	Yes	112,000	8.0
6/20/2005	Station 8	28.1 C	24 ft	Yes	119,000	7.9
			24 ft - deep			
6/20/2005	Station 8	20.4 C	brine	No	130,000	7.6
6/20/2005	Station 9	25.6 C	25 ft	Yes	120,000	7.9
	Station					
9/15/2005	10	28.5 C	25 ft	Yes	118,000	8.0
			25 ft			
	Station		deep			
6/20/2005	10	18.2 C	brine	No	130,000	7.7
9/15/2005	Station 1	19.1 C	10 ft	Yes	101,000	8.1
9/15/2005	Station 2	22.5 C	8 in	Yes	101,300	8.1
			Collected at Station	does not		
9/15/2005	Station 2	Field Blank	2	apply	does not apply	does not apply
9/15/2005	Station 5	22.5 C	8 in	Yes	101,000	8.1
9/15/2005	Station 6	22.5 C	1 ft	Yes	103,000	8.1
9/15/2005	Station 7	22.5 C		Yes	100,500	8.1
9/15/2005	Station 8	20.8 C	25	Yes	102,700	8.1
			25 ft			
			deep			
9/15/2005	Station 8	ND	brine	No	116,000	7.7

9/15/2005	Station 9	22 C	15 ft	Yes	101,000	8.1
	Station					
9/15/2005	10	22.5	24 ft	Yes	100,000	8.1
			24 ft			
	Station		deep			
9/15/2005	10	ND	brine	No	115,000	7.6

\* Note, pH of the Lake is typically measured at 8.0 to 8.1 due to its large buffering system.

\*\* Water depth refers to distance to bottom of Lake. All samples were surface samples unless other wise noted.

Table 5. Sampling coordinates for the Great Salt Lake designed to Match the stations shown in Figure 1.

Station Number Used in This Report	Coordinates <sup>1</sup>
Station 1	40° 44.23' North and 112° 14.93' West
Station 2	40° 45.153' North and 112° 11.505' West
Station 3	40° 45.947' North and 112° 10.544' West
Station 4	40° 46.033' North and 112° 10.956' West
Station 5	40° 46.323' North and 112° 10.812' West
Station 6	40° 46.245' North and 112° 10.360' West
Station 7	40° 46.510' North and 112° 10.521' West
Station 8	40° 47.048' North and 112° 12.103' West
Station 9	40° 51.000' North and 112° 11.167' West
Station 10	40° 55.917' North and 112° 16.317' West
Station 11	40° 54.719' North and 112° 04.849' West
Station 12	40° 56.030' North and 112° 05.959' West
Station 13	40° 47.566' North and 112° 11.082' West
Station 14	40° 49.124' North and 112° 10.998' West
Station 15	40° 53.866' North and 112° 14.655' West
Station 16	40° 53.548' North and 112° 15.923' West
Station 17	40° 45.627' North and 112° 10.227' West
Station 18	40° 46.304' North and 112° 10.632' West
Station 19	40° 46.622' North and 112° 10.850' West
Station 20	40° 46.603' North and 112° 10.849' West
Station 21	40° 46.591' North and 112° 10.852' West
Station 22	41° 03.679' North and 112° 14.684' West
Station 23	41° 26.117' North and 112° 40.267' West
Station 24	40° 56.624' North and 111° 56.374' West
Station 25	40° 56.533' North and 112° 00.225' West

<sup>1</sup> Some stations were sampled at slightly different coordinates each event. For these cases, only coordinates from the first sampling event are shown for brevity (coordinates from remaining sampling events are assumed to be very similar, but not exactly the same).